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Birth Outcome after Caesarean Section among Mothers who Delivered by Caesarean Section under General and Spinal Anesthesia at Gondar University Teaching Hospital North-West Ethiopia

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Abstract

Introduction: Intrapartum death is the leading cause of child mortality in the world. In Africa, 62 new borns die out of 1000 live births. Anesthesia is responsible for 89 intrapartum deaths per 1000 live births and 3-12% maternal deaths; which are almost associated with the use of general anesthesia. The objective of this study was to assess neonatal outcomes using APGAR score among mothers delivered by caesarean section at Gondar University Hospital, North west Ethiopia.

Methods: An institution based cross sectional study was used to assess neonatal outcomes after caesarean sectionamong mothers delivered by caesarean section under anesthesia. All mothers that came for caesarean section from January1, to April 30, 2012 were included in this study Data were collected using structured questionnaires. All pre delivery questionnaires were filled during pre operative preparation after taking informed consent and other intra operative events were recorded intra operatively in the operation room. Data entry and analysis was done using SPSS version 16, each variable was entered to bivariate analysis, variables with P value <0.2 were taken to multivariate analysis using logistic regression.

Results: The use of general anesthesia for caesarean section in this particular study was more frequent when compared with spinal anesthesia (65%). The risk of Low APGAR score 5 was increased in babies born under general anesthesia as compared with babies born under Spinal anesthesia (AOR=3.19,95% C.I.(1.73, 5.90)). Low Fetal weight was associated with low APGAR score of new borns (AOR=1.38 with 95% C.I. (1.10, 1.70)). Pre anesthetic fetal heart rate and uterine incision to delivery time were also found to be associated with APGAR score 5 of neonates (AOR=2.12, (95% CI, 1.20; 3.60) and 2.57, (95% CI, 1.20, 3.50)) respectively.

Conclusion: Neonates born under Spinal anesthesia had better physiologic profile as evidenced by APGAR score 5. The use of general anesthesia should be reduced and reserved for special indications that are contra indicated to spinal anesthesia only. Low birth weight, prolonged uterine incision to delivery of the baby and pre anesthetic fetal heart beat has affected APGAR score 5 of newborns.

Keywords: Birth outcome; APGAR score; Ethiopia

Introduction

Deaths during immediate extra uterine life are a leading cause of child mortality which accounts for 6.3 million child deaths worldwide. In Africa according to WHO report 2006, 62 newborns die out of 1000 live births. This figure is 43/1000 live births in Uganda and 39/1000 live births in Ethiopia [1,2].

Different conditions can pre dispose to this early life loss; Low Birth Weight (LBW), anomalies, infections and intrapartum related conditions associated to birth asphyxia alone contributes for 23% of all causes. Mode of delivery especially caesarean delivery is the leading cause of birth asphyxia due to added stress of anesthesia [3-5].

The rate of cesarean section has been increasing worldwide. It exceeds 24% in USA, Canada and Greece [6]. According to WHO's 2009 survey, the rate of caesarean section in Africa was 8.8%, which ranges from 1.1% in Angola to 18% in democratic republic of Congo [7]. A study conducted in Nigeria from 1990-2005; has shown that caesarean section (C/S) for emergency cases has increased from 11.3%-20.9% and for elective cases the rate increased from 1.2 to 6.2% [8].

Intrapartum deaths associated with C/S are much higher in countries with poor socio economic status. For instance a study from Afghanistan showed that C/S associated perinatal death was 89.2/1000 births; and caesarean section C/S associated still birth was 84,1/1000 births [9]. A study conducted in Ethiopia, Yekatit hospital, from 1987-1992 showed that perinatal mortality of neonates born under caesarean section was 153.5/1000 live births and maternal case fatality rate of 1.1% [10].

Babies born under caesarean section are more liable to birth asphyxia due to factors associated with indications of caesarean section and added stress of anesthesia. Birth asphyxia as evidenced by low APGAR score is common among babies born by caesarean section under general anesthesia as compared with regional anesthesia [11].

Various factors have been identified to affect neonatal and maternal

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out comes during caesarean section. Types of anesthesia, maternal medical condition, decision to delivery interval, uterine incision to delivery time, are some of these factors [12]. Thus, this study is aimed to assess neonatal outcomes as evidenced by APGAR score among mothers delivered by caesarean section under general anesthesia as compared with spinal anesthesia and identify associated factors of low APGAR score.

Methods

An institution based cross sectional study was used to assess immediate birth outcomes after caesarean sectionamong mothers delivered by caesarean section under general and spinal anesthesia at Gondar university hospital. The hospital is found in Gondar town which is located at 727 km distance from the capital city of Ethiopia. The hospital serves about 5 million people in the catchment area.Annually about 5000 patients got surgical services in the hospital, caesarean section being one of these procedures. Report from the hospital's statistics shows that in the year 2010, two thousand two hundred thirty five mothers visited the hospital for delivery service, from this 1608 mothers delivered spontaneously and 627 under gone caesarean section. All mothers that came for caesarean section from January 1, to April 30, 2012 were included in the study. Mothers with severe medical and obstetric illnesses as severe preeclampsia, complicated diabetes, mothers with Intra Uterine Fetal Death (IUFD) and indications like fetal bradycardia, acute hemorrhage and mothers with hemodynamic instability were excluded from the study.

Data on socio demographic variables were collected using structured questionnaires. This was done in labor ward after taking informed consent. The other intra operative events were collected in the operation room during the procedure by the data collectors. Anesthesia was given for every mother who came to operation room for caesarean section as routine. Anesthesia In all mothers delivered under spinal anesthesia, heavy Bupivacaine was used and for the GA cases, 62.5% were induced with ketamine, 29.2% were induced with thiopentone and the rest 8.2% were induced with Propofol. For all the general anesthesia groups, anesthesia was maintained by Halothane, there are no drugs like Sevoflorane and fentanyl in the hospital at the time of data collection. Anesthetic technique and drugs selection was done entirely by anesthetists. Integrated (BP, pulse oxymetry, Capnography and temperature) monitors are used for all cases as usual.

The questionnaires were checked for completeness before entry and variables were coded. Data entry and analysis was done using SPSS version 16. Tables and graphs were used to summarize descriptive results. Each variable was entered to bivariate analysis with dependent variables, and those variables with P value of <0.2 interred to multiple logistic regression, Odds ratio, 95% confidence interval and p-value were used to identify associated factors and to determine strength of association with the dependent variables.

Low APGAR score is defined as new born whose 5 minutes APGAR score is less than 7.

Ethical clearance was obtained from Gondar University's ethical review board. Permission letter from Gondar university hospital's medical director was also obtained. Verbal consent was obtained from each mother and the purpose of this study was explained to each mother. Whenever mothers have contractions, questions were paused. Privacy of mothers was kept during interview and the information was confidential.

Results

Sociodemographic characteristics

A total of 315 caesarean sections were done within the study period making caesarean section rate of 27%. Two hundred eighty five questionnaires were used for analysis after questionnaires were checked for completeness.One hundred forty five (50.9%) and 140(40.1%) of the mothers were rural and urban dwellers respectively. The mean age of mothers was 26.8 years with standard deviation of 5.4 years. Most of the mothers (61.4%) were in the age range of 20-24 years. Two hundred fourteen (75.1%) of the mothers had antenatal follow up. Majority of the mothers (75%) were house wives by occupation. Fifty three (18.6%) of mothers were operated at gestational age of <37 weeks. One hundred eight five (64.9%) were operated within 37-40 weeks. The most frequent indication of caesarean section in this study was fetal distress (23.2%) followed by mal position (14%) (Table 1 and Figure 1).

Maternal and neonatal characteristics

Two hundred sixty two (91.9%) of the cases were emergency caesarean sections. Two hundred fifty three (88.8%) of the cases were operated by residents and the rest 32 (11.3%) were operated by senior Obstetricians.One hundred eighty eight (65.9%) of the cases were operated under general anesthesia, and the rest 97 (34.1%) were done under spinal anesthesia. Out of 97 patients operated under spinal anesthesia, 8 patients (8.3%) developed hypotension after spinal block and were given adrenaline 10 µgmIV. For 173 (60.7%) of them Diclofenac was used as a post operative analgesia, Tap block was used for 18 cases and for the rest 94 mothers none was used to control post operative pain (Table 1 and Figure 2).

The minimum and maximum birth weights were 1.2 and 4.6 kg respectively. Two hundred nine (73.3%) of the babies had birth weight

Variables	Frequency	Percentage
Age group		
15-19	16	5.6
20-24	73	25.6
25-35	175	61.4
36 and above	21	7.3
Residence		
Rural	145	50.9
Urban	140	49.1
Occupation		
House wife	214	75.1
Governmental employee	29	10.2
Merchant	22	7.7
Daily laborer	7	2.5
Student	13	4.6
ANC follow up		
Yes	214	75
No	71	25
Gestational age		
≤ 37 weeks	53	18.6
37-40 weeks	185	65
>40 weeks	47	16.4
Operator status		
Senior	32	11.3
Resident/GP	235	88.7
Type of anesthesia		
GA	188	65.9
SA	97	34.1
Type of surgery		
Emergency	262	92
Elective	23	8

Table 1: Sociodemographic characteristics of mothers delivered under caesarean section at, University of Gondar hospital, January, 1-April 30, 2012.

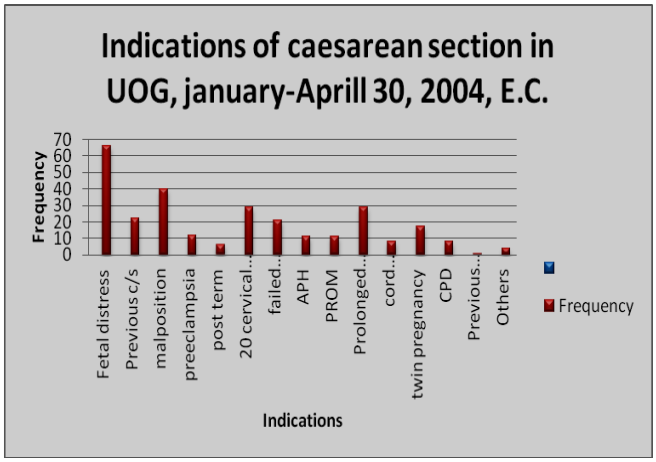

Figure 1: Indications of caesarean section in UOG, from January 1-April 30, 2012, North West Ethiopia .

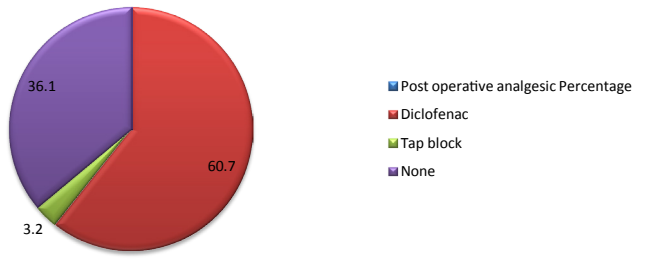

Figure 2: Post operative analgesic modality for caesarean section in UOG, from January 1-April 30, 2012, North West Ethiopia.

Variables	Number	Percent
Neonatal birth weight		
<2.5 kg	76	26.7
≥ 2.5 kg	209	73.3
Apgar score 5		
<7	107	62.5%
≥ 7	178	37.5%
Co existing medical illness		
Hypertension	10	3.5
Asthma	4	1.4
HIV	11	3.85
Others	10	3.5
None	250	87.7

Table 2: Maternal and neonatal out comes, UOG, January 1-April 30, 2012 Gondar Ethiopia.

of greater or equal to 2.5 kg. The mean birth weight of babies was 3.05 kg with standard deviation of 0.49 kg. In 38.6% of the operations uterine incision to delivery of the baby was done within 3 minutes. The mean uterine incision to delivery of the babies was 3.79 minutes with standard deviation of 1.08 minutes. The minimum and maximum blood loss was 150 and 2000 ml respectively. One hundred seven (37.5%) of the babies had APGAR score 5 less than 7 and the rest have APGAR score 5 of greater than 7. Majority of the cases (92%) were emergency caesarean sections. None of the new born died immediately after delivery, but those with APGAR score <4 were referred to neonatal care unit.

The mean APGAR 5, for neonates born underspinal anesthesiawas 8.03 with standard deviation of 1.39, and for those who born under general anesthesia,the mean APGAR score 5 was 6.89 with standard deviation of 1.4 (Table 2).

Factors associated with APGAR score

As can be depicted from multiple logistic regression types of anesthesia, fetal weight, and uterine incision to delivery of the fetus and pre operative fetal heart rate were found to be significantly associated with low APGAR 5 score at 0.05 level of significant. Those babies delivered under spinal anesthesia had better physiologic profile than babies born under general anesthesia as evidenced by APGAR score

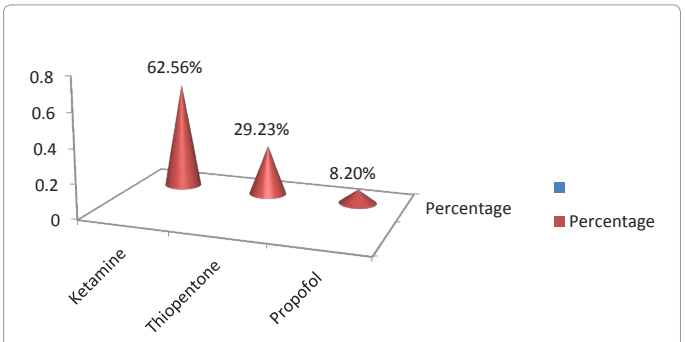

Figure 3: Induction drugs used for general anesthesia groups for caesarean section in UOG, from January 1-April 30, 2012, North West Ethiopia.

Variables	Crude odds ratio	p-value	SE of B	95% CI	
Gestational age					
<37 weeks					
37-42 weeks	0.787	0.553	0.404	0.357	1.736
>42 weeks	1.368	0.351	0.336	0.708	2.643
Age of mothers					
<18					
19-35	1.000	1.000	0.697	0.255	3.922
>35	1.165	0.748	0.475	0.459	2.955
Type of surgery					
Elective					
Emergency	2.222	0.126	0.521	0.800	6.173
Residence					
Rural					
Urban	0.966	0.887	0.246	0.597	1.563
ANC					
Yes					
No	1.466	0.170	0.279	0.848	2.534
Occupation					
House wife					
Gov. employee	0.455	0.242	0.673	0.122	1.703
Merchant	1.440	0.657	0.822	0.288	7.206
Daily laborer	0.433	0.289	0.788	0.092	2.031
Student	0.400	0.363	1.008	0.055	2.886
FHB					
<120					
120-160	0.213	0.014	0.626	0.063	0.727
>160	0.530	0.274	0.581	0.170	1.655
Type of anesthesia					
GA					
SA	0.265	0.000	0.299	0.147	0.476
Operator status					
GP					
Senior	1.598	0.378	0.215	0.762	3.351
Decision to delivery time					
<30 minutes					
>30 minutes	0.861	0.705	0.395	0.397	1.867

Table 3: Bi variate analysis of Factors Associated with APGAR SCORE 5 among neonates delivered under general and Spinal anesthesia in GUH, January 1 to April 30, 2012.

Variables	APGAR score 5		COR (95% C.I)	AOR (95% C.I)
	<7	≥ 7		
Typeof anesthesia				
GA	88 (46.8%)	100 (53.2%)	1.00	
SA	18 (18.6%)	79 (81.4%)	3.8 (2.20-6.90)**	3.2 (1.80-5.90)**
Fetal Weight				
<2.5	40 (37.8%)	66(62.2%)	1.00	
≥ 2.5	36 (20%)	143 (80%)	1.4 (1.14-1.70)**	1.38 (1.10-1.70)**
Fetal Heart rate				
<120	23 (59%)	16 (41%)	1.00	
120-159	73 (34.6%)	138 (35.4%)	2.7 (1.30-5.46)**	2.12 (1.20-3.60)**
160 and above	10 (28.6%)	25 (71.4%)	3.6 (1.36-9.50)*	
Uterine incision				
≤ 3 minutes	52 (47.2%)	58 (52.8%)	1.00	
>3 minutes	54 (30.8%)	121 (69.2%)	2.009 (1.20-3.20)**	2.057 (1.20-3.50)**

**Significant at P<0.001, * Significant at P <0.05

Table 4: Factors Associated with APGAR SCORE 5 among neonates delivered under general and Spinal anesthesia in GUH, January 1 to April 30, 2012.

5. Babies born under general anesthesia were 3 times more likely to have low APGAR score 5 when compared to those born under spinal anesthesia (AOR=3.19,95% C.I. (1.73, 5.90)).With respect to fetal weight, babies with birth weight greater or equal to 2.5 kg had better APGAR score 5 as compared to those babies with birth weight less than 2.5 kg (AOR=1.38, 95% C.I. 1.10, 1.74) (Table 3).

Whereas, babies whose pre anesthetic heart rate was above 160 beat per minute had shown better APGAR score 5 when compared with babies whose pre anesthetic heart rate were below 120 and between 120 and 160 (AOD=3.59, 95% C.I.(1.36,)). Regarding uterine incision to delivery time, babies born within 3 minutes of uterine incision had better physiologic profile as evidenced by APGAR score 5, when compared with those babies whose uterine incision to delivery time exceeds 3 minutes, (AOR=2.009, 95% C.I.(1.23, 3.30)) (Table 4).

Discussion

The prevalence of Low APGAR score was 37.5%. This is higher than the review conducted in Uganda teaching hospital from 1998-2000 which was 28%, [13]. Another study conducted in Nigeria Lagos in 2010 also reported a low APGAR score 5 of 28% [14]. The higher incidence of low APGARscore in Gondar University Hospital could be attributed to pre anesthetic condition as 92% of the cases were emergency C/S, fetal distress being the leading indication.

Low APGARscore 5 was associated with type of anesthesia, accordingly neonates born under general anesthesia showed significant lowering of APGAR5, as compared with neonates born under spinal anesthesia. This finding is consistent with a randomized controlled study conducted in Turkey among mothers that delivered under general anaesthesia and spinal anaesthesia [15]. This could be explained by the high lipid solubility of drugs used for general anesthesia that readily cross the placenta and depress the neonates more often than local anesthetic agents used for spinal anesthesia.

The use of general anesthesia was associated with increased maternal blood loss in this study as compared to use of spinal anesthesia. This finding is in line with the study conducted in South Korea where mothers operated under general anesthesia developed immediate drop in hematocrit value when compared with mothers operated under spinal anesthesia [16]. This could be explained by the uterine relaxing effect of halogenated anesthetic agents that could result in increased blood loss during use of general anesthesia.

Low birth weight (birth weight <2.5 kg) was found to be associated with low Apgar score. This is inline with a retrospective study among 601 neonates in Denmark, where neonates with low birth weight had low Apgar score 5, as compared with those with birth weight ≥ 2.5 kg [17].

Another factor that showed association with APGAR score 5 was pre anesthetic fetal heart rate.Babies with pre anesthetic fetal heart rate of greater than 160 beat per minute have better APGAR score 5 as compared to babies with pre anesthetic fetal heart rate of 120-160 beat per minute and less than120 beat per minute. This is in contrast with the finding of a study conducted in Greece that concluded as there is no association between pre anesthetic fetal heart rate and Apgar score [18]. The discrepancy might be due to the difference in study setting.

Uterine incision to delivery of the baby had association with APGAR score 5. Neonates born within 3 minutes and less had better Apgar score 5, when compared with those babies whose uterine incision to delivery time exceeds 3 minutes. This finding is consistent with finding of which showed only 4% of neonates born within 3 minutes of uterine incision had low APGARscore while from those whose uterine incision to delivery time exceeds 3 minutes 73% had low APGAR score 5. This could be due to prolonged interruption of placental perfusion when the interval between uterine incision and delivery of the fetus is prolonged.

Conclusions

The prevalence of low APGAR score 5 was found to be high in this study. Large proportion of newborns delivered under general anesthesia developed low APGAR score 5 than that spinal anesthesia. The use of general anesthesia for caesarean section should be minimized and reserved only for those who are contra indicated to spinal anesthesia. Low birth weight, prolonged uterine incision to delivery of the baby, pre anesthetic fatal heart rate less than120 and general anesthesia were found to be associated factors of low APGAR score 5.

Further Research should be conducted using better indicator of neonatal asphyxia, as Arterial Blood Gas analysis.

Competing Interests

The authors declare that they have no competing interests.

Authors' contributions

Zewditu Abdissa initiated the research idea, designed the study, performed the statistical analysis and drafted the manuscript. Tadesse Awoke, Tadesse Belayneh and Yifokir Tefera participated in the study design, implementation of the study, statistical analysis and contributed to the draft manuscript.All authors contributed to the data analysis, read and approved the final manuscript.

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